on the 22d. The storm came from the southwest and passed off to the northeast.

Tennessee.—Chattanooga: a high easterly wind occurred at 5.15 p. m. on the 3d; small trees, etc., were blown down; no serious damage resulted. A violent thunder storm, moving from north to south, began at 8.65 a. m. on the 29th; it lasted fifteen minutes, and was accompanied by blinding sheets of lightning and heavy rain. Two dwellings were struck by lightning and some of the occupants were severely stunned.

Clarksville, Montgomery county: on the 22d a damaging hail storm passed through the southern and western portions of this county, causing, in many localities, total ruin to the tobacco crop. In a few farm houses the windows were broken by the hailstones.

Nashville: a severe storm occurred during the evening of the 29th. In the surrounding country trees were blown down and the crops damaged. The rain was very heavy and caused several small streams to overflow. Numerous buildings were struck by lightning. At 7 p. m. of the 29th a tornado occurred near Milan, Gibson county. As the funnel-shaped cloud did not reach the ground no loss of life or property occurred.

Texas.—Dallas, Dallas county: on the afternoon of the 23d a tornado cloud was observed approaching this place from the northeast. When first seen it was moving with great velocity at an altitude of several hundred feet. Before reaching this place it took an upward course and disappeared among the clouds, but immediately reappeared, striking the town near the south end of Lamar street. The cloud again bounded with great velocity, carrying a large column of sand to a height of five hundred feet, finally disappearing in the southwest.

Utah.—Salt Lake City: a "cloud burst" is reported to have occurred on the 8th, in City Creek cañon, about one mile from this place.

Virginia.—Fort Myer: a violent squall from the northwest occurred at 2.35 p. m. on the 21st; the wind attained a velocity of forty miles per hour.

Petersburg, Dinwiddie county: the adjoining county (Chesterfield) lying north, was visited by a severe storm on the evening of the 21st, blowing down trees and outbuildings. In some places the storm was accompanied by hail and heavy rain, while in others the precipitation was very light.

Wisconsin.—Reedsburg, Sauk county: at 5 p. m. of the 2d a destructive tornado passed north of this village, pursuing an easterly course. It appears to have started in the vicinity of Cazenovia, Richland county, twelve miles west of Reedsburg, where numerous barns and dwellings were demolished, and extended eastward to near Lewiston, Columbia county. The storm cloud was observed to have a rotary motion, and its course throughout was marked by fallen timber, grain, fences, etc. It struck a heavy growth of timber about one mile west of Reedsburg, blowing down and breaking off the trees. The storm's path in that vicinity was about one-half mile wide, while in other localities its width was from ten to twenty rods. Its direction was east, ten degrees north, and its path was about thirty miles in length. No loss of life occurred.

Boscobel, Grant County: at 6.20 p. m. on August 22d a tornado, moved east, ten degrees north, with considerable destruction of property, Also on August 22d, at Montana, Buffalo county, at 4.30 p. m., a tornado, moving eastward, caused considerable destruction to property.

NAVIGATION.

STAGE OF WATER IN RIVERS.

The observer at Nashville, Tennessee, reports that navigation on the Cumberland river was suspended throughout the month on account of the low stage of water.

During the latter part of the month the Tennessee river, at Chattanooga, was navigable only for boats of light draft.

The Ohio river was highest during the first decade of the month and lowest during the last decade. Reports from Vevay, Switzerland county, Indiana, state that numerous boats ran aground opposite that place on account of the low stage of water during the latter part of the month.

In the upper Mississippi the difference between the highest and lowest stages was from one foot and three inches at Saint Paul, Minnesota and LaCrosse, Wisconsin, to two feet and five inches at Keokuk, Iowa. From Saint Louis, Missouri, to Vicksburg, Mississippi the range varied from seven feet eight inches, at the first named station to slightly over ten feet at Cairo, Illinois. At Saint Paul navigation was suspended on account of low-water on the 5th. The Missouri river was at its highest stage on the 1st, and was lowest from the 18th to 24th.

In the following table are shown the danger points at the various river stations, the highest and lowest stages for August, 1884, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark. August. 1884.

Stations.	Danger-point on gauge.	Highest water. Date.	Highest water. Height.	Lowest water. Date.	Lowest water. Height.	Monthly range.
Red River:	Ft. In.		Ft. In.		Ft. In.	Ft. In.
Shreveport, Louisiana	29 9	1	6 8	31	1 6	5 2
Arkansas:						
Little Rock, Arkansas	33 0	1	8 0	18	3 11	4 1
Fort Smith, Arkansas	.....	21, 26	† 0 10	13, 14	† 3 5	2 7
Missouri:						
Yankton, Dakota	20 0	1	17 3	23	14 10	2 5
Omaha, Nebraska	16 0	1	9 0	11,12,22, 23, 24	7 3	1 9
Leavenworth, Kansas	21 0	1	14 0	18	9 5	4 7
Mississippi:						
Saint Paul, Minnesota	14 6	30, 31	3 1	10	1 10	1 3
La Crosse, Wisconsin	18 0	3	2 3	18, 19	1 0	1 3
Dubuque, Iowa	21 10	7	5 5	17,19,20	3 8	1 10
Davenport, Iowa	15 0	9	3 7	17, 18	2 5	1 2
Keokuk, Iowa	14 6	29	5 0	20	2 7	2 5
Saint Louis, Missouri	30 0	1	17 2	24	9 6	7 8
Cairo, Illinois	40 0	4	19 0	28	8 10	10 2
Memphis, Tennessee	34 0	5, 6, 7	13 5	31	5 1	8 4
Vicksburg, Mississippi	41 0	9 to 12	18 8	31	9 1	9 7
New Orleans, Louisiana*	—2 6	1	— 8 8	29,30,31	—12 7	3 11
Ohio:						
Pittsburg, Pennsylvania	20 0	1	5 4	21,28,29	0 5	4 11
Cincinnati, Ohio	50 0	6	12 10	26, 27	4 5	8 5
Louisville, Kentucky	24 0	7	6 0	27	3 0	3 0
Cumberland:						
Nashville, Tennessee	42 0	5	7 4	28, 29	1 1	6 3
Tennessee:						
Chattanooga, Tennessee	33 0	2	9 10	28, 29	1 10	8 0
Monongahela:						
Pittsburg, Pennsylvania	29 0	1	5 4	21,28,29	0 5	4 11
Savannah:						
Augusta, Georgia	.....	12	8 9	20	5 5	3 4
Willamette:						
Portland, Oregon	.....	7	7 8	31	3 8	4 0
Sacramento:						
Red Bluff, California	.....	1 to 4	1 2	30, 31	0 10	0 4
Sacramento, California	.....	1	11 6	31	8 7	2 11
Mobile:						
Mobile, Alabama	....	19	18 0	14	15 10	2 2
Colorado:						
Yuma, Arizona	.....	.....	.....	.....	.....	.....

† Below bench mark. * Below high-water mark of 1874 and 1883.

FLOODS.

Eureka, Eureka county, Nevada: a destructive flood occurred at this place on the 7th. The water came from Ruby Hill and entered Adams Hill cañon. When the stream reached the Williamsburg mine it was thirty feet wide and seven feet deep. The Titus mine was filled with water and one man drowned.

Puerto de Luna, San Miguel county, New Mexico: the Rio Pecos river reached a high stage during the latter part of the month. The highest point was attained on the afternoon of the 24th, when the water was only a few inches below the flood marks of 1880. Much damage was done to the dams and irrigating ditches; and the crops on the bottom lands were entirely destroyed. One man and a number of animals were drowned near Puerto de Luna.

HIGH TIDES.

New River Inlet, North Carolina: daily from 5th to 15th.

LOW TIDES.

The following note is taken from the "New York Journal of Commerce," of August 12, 1884:

Biloxi, Mississippi, August 6th: the extraordinary continuance of low tides operates greatly to delay the passage over the bar of vessels of deep draft.

Low tides were also reported from the following stations:
Eastport, Maine, 2d.
Indianola, Texas, 2d.

WATER TEMPERATURE.

The following table gives the normal temperature of water at surface; the highest and lowest temperatures of the water at the several stations; the range of water temperature; the mean temperature of the air at the station; and the depth of water at which the observations are taken:

Temperature of water for August, 1884.

Station.	Normal temperature of water at surface.	Temperature at bottom. Max.	Temperature at bottom. Min.	Range.	Average depth, feet and inches.	Mean temperature of the air at station.
	°	°	°	°	ft. in.	°
Atlantic City, New Jersey	71.4	73.9	72.4	3.5	2 9	71.5
Alpena, Michigan	69.9	72.8	69.5	9.3	12 3	62.6
Augusta, Georgia	84.2	86.7	80.0	6.7	6 7	79.1
Baltimore, Maryland	78.0	79.7	76.1	3.6	9 10	75.2
Block Island, Rhode Island	66.9	69.0	63.2	5.8	7 10	67.4
Boston, Massachusetts	64.3	68.5	62.5	6.0	20 10	68.3
Buffalo, New York	71.5	73.6	68.4	5.2	9 7	67.5
Canby, Fort, Washington Territory	165.6	67.1	58.5	8.6	15 9	60.7
Cedar Keys, Florida	86.5	87.2	83.4	3.8	10 11	81.2
Charleston, South Carolina	83.4	84.3	78.5	5.8	41 6	78.9
Chicago, Illinois	69.3	73.2	60.4	12.8	8 3	68.8
Chincoteague, Virginia	77.7	83.6	69.0	14.6	4 3	73.3
Cleveland, Ohio	72.8	76.1	69.2	6.9	14 0	68.2
Detroit, Michigan	71.2	75.0	66.6	8.4	23 0	69.4
Delaware Breakwater, Delaware	72.3	76.7	67.4	9.3	9 1	72.6
Duluth, Minnesota	61.9	70.2	53.3	16.9	9 11	63.7
Eastport, Maine	49.9	51.0	48.6	2.4	14 9	61.0
Escanaba, Michigan	65.2	70.2	57.0	13.2	18 3	62.7
Galveston, Texas	84.3	88.0	83.3	4.7	12 1	83.8
Grand Haven, Michigan	71.9	77.2	66.1	11.1	19 0	65.7
Indianola, Texas	86.5	87.6	84.1	3.5	8 11	81.9
Jacksonville, Florida	86.4	87.8	84.0	3.8	18 0	79.8
Key West, Florida	87.3	89.1	85.1	4.0	16 9	83.9
Mackinaw City, Michigan	†64.6	72.6	56.0	16.6	10 0	62.2
Macon, Fort, North Carolina	†79.8	81.5	76.0	5.5	9 0	76.6
Marquette, Michigan	60.3	62.8	51.6	11.2	10 0	63.0
Milwaukee, Wisconsin	64.3	70.8	48.1	22.7	8 0	65.8
Mobile, Alabama	85.1	86.0	80.0	6.0	16 11	78.7
New Haven, Connecticut	73.0	77.0	68.0	9.0	15 6	69.1
New London, Connecticut	71.6	70.3	64.0	6.3	12 10	68.5
New York City	72.8	74.3	70.2	4.1	16 3	71.5
Norfolk, Virginia	80.0	81.8	73.8	7.8	16 7	76 0
Pensacola, Florida	84.9	87.3	80.1	7.2	17 4	80.2
Portland, Maine	60.8	63.6	56.3	7.3	16 7	67.5
Portland, Oregon	68.8	75.2	72.2	3.0	56 11	68.0
Sandusky, Ohio	74.1	77.0	68.0	9.0	10 9	70.4
Sandy Hook, New Jersey	72.1	70.3	68.4	7.9	1 3	71.7
San Francisco, California	60.4	62.0	56.3	5.7	38 7	58.7
Savannah, Georgia	83.7	*85.6	*79.8	5.8	10 6	78.7
Smithville, North Carolina	82.3	83.0	77.0	6.0	10 10	77.1
Toledo, Ohio	74.8	77.1	69.2	7.9	11 8	70.0
Wilmington, North Carolina	81.3	82.3	74.5	7.8	20 8	76.9

* Record for 27 days. ‡ For 1 year only. † Record for 2 years only.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for August, 1884, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 83.40 per cent. The percentages for the four elements are: Weather, 89.12; direction of the wind, 80.22; temperature, 80.61; barometer, 82.47 per cent. By geographical districts, they are: For New England, 84.12; middle Atlantic states, 83.47; south Atlantic states, 85.71; eastern Gulf states, 85.33; western Gulf states, 84.15; lower lake region, 82.76; upper lake region, 82.18; Ohio valley and Tennessee, 82.32; upper Mississippi valley, 85.36; Missouri valley, 76.75; north Pacific coast region, 83.87; middle Pacific coast region, 100.0; south Pacific coast region, 100.0. There were eleven omissions to predict out of 3,191, or 0.34 per cent. Of the 3,180 predictions that have been made, eighty or, 2.51 per cent., are considered to have entirely failed; one hundred and forty-six, or 4.59 per cent., were one-fourth verified; three hundred and sixty-seven, or 11.54 per cent., were one-half verified; six hundred and nineteen, or 19.47 per cent., were three-fourths verified; 1,968, or 61.89 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

During August, 1884, fifty-nine cautionary signals were ordered. Of these, twenty-eight, or 47.46 per cent., were justified by winds of twenty-five miles or more per hour at or within one hundred miles of the station. No off-shore signals were ordered. The above number does not include signals ordered at display stations where the velocity of the wind is only estimated.

During the month there were seventy-four occurrences of velocities of twenty-five miles per hour or more without signal displays. Of this number there were five cases in which the signal displays were late and one in which the signal was lowered too soon. The following is a record of these occurrences, giving for each date the stations, direction, velocity and duration of gale when reported:

August 1st: Indianola, 29 miles; Fort Macon, nw., 42, 2½ hours.

August 3d: Kitty Hawk, sw., 25, ¼ hour; Detroit, sw., 25, 2 hours, signal order late.

August 4th: Barnegat, sw., 28; Little Egg Harbor, s., high; Sandy Hook, 26; Cape May, s. 26, 10 hours; Delaware Breakwater, sw., 32; Fort Macon, sw., 28, 11 hours; Smithville, sw., 26, squall; New Orleans, nw., 34, squall.

August 5th: Block Island, sw., 26; Kitty Hawk, w. 26, squall; Fort Macon, sw., 30, squall.

August 6th: Duluth, n., 26, signal late; Grand Haven, w., 28.

August 7th: Cape Henry, n., 28, signal late; Chincoteague, n., 27, signal late; Delaware Breakwater, ne., 30, signal late; Sandusky, n., 30, 3 hours.

August 11th: Kitty Hawk, ne., 31, 4 hours.

August 12th: Delaware Breakwater, 26; Cape Henry, ne., 28, 17 hours; Kitty Hawk, ne., 36, 9 hours; Fort Macon, ne., 27, 1 hour.

August 13th: Block Island, ne., 32; Point Judith, ne., high; Kitty Hawk, ne., 35, 23 hours.

August 14th: Kitty Hawk, ne., 31, 12 hours.

August 15th: Fort Macon, ne., 26, 1 hour.

August 17th: Kitty Hawk, ne., 25, 1 hour.

August 18th: Duluth, ne., 28; Grand Haven, s. 32; Milwaukee, sw., 28, 2 hours.

August 19th: Key West, ne., 31, squalls, the "Alice Vane" lost her foretopmast; Grand Haven, s., 32, vessel dismasted in squall, damage $1,100.

August 20th: Milwaukee, sw., 32, 7 hours.

August 21st: Cape May, s., 30, 6 hours; Kitty Hawk, sw., 27, 2 hours.

August 22d: Block Island, sw., 26; Sandy Hook, w., 34; Delaware Breakwater, s., 53, squalls; Cape May, s., 52, squalls.

August 23d: Grand Haven, nw., 27; Buffalo, sw., 36, squalls, lake very rough; Rochester, w., 28, 4 hours.

August 24th: Eastport, nw., 26, twenty minutes; Kitty Hawk, e., 29; Cape Henry, ne., 27, at night; Sandusky, n., 26, forty-five minutes; Sandy Hook, n., 30; Thatcher's Island, n., 31, ½ hour.

August 25th: Oswego, sw., 26, 20 hours, schooner "Belle" sunk; Fort Macon, ne., 27, 1 hour; Thatcher's Island, nw., 29, 3 hours; Kitty Hawk, e., 29; Grand Haven, s., 28; Escanaba, s., 28, ½ hour; s., 33, 4 hours; s., 30, 1½ hours; this was a local storm but did some damage.

August 26th: Buffalo, sw., 26, 18 hours; Thatcher's Island, se., 32, 6 hours.

August 27th: Marquette, se., 26.

August 28th: Buffalo, 26, squall.

August 26th: Rochester, s., 26, ½ hour; Buffalo, sw., 28, 1 hour; Kitty Hawk, s., 27, 4½ hours.

August 30th: Chincoteague, nw., 36, signal late; Delaware Breakwater, 31, signal lowered early; Kitty Hawk, nw., 26, 4½ hours; Fort Macon, sw., 27, 8 hours; Sandy Hook, nw., 40, squall; New York, e., 32, squall; Indianola, 30, light "norther"; Rochester, w., 27, 1 hour; Buffalo, sw., 35, squall.

August 31st: Fort Macon, sw., 34, 1 hour; Indianola, 31, light "norther."